1) Consider the following CREATE statements expressed in the object-relational model of Oracle:

CREATE TYPE project_t AS OBJECT
    (P# INTEGER,
    Name VARCHAR (20),
    Budget INTEGER);

CREATE TYPE project_list AS TABLE project_t;

CREATE TABLE Departments
    (D# INTEGER,
    Dname VARCHAR(20),
    Projects project_list,
    NESTED TABLE Projects STORE AS project_tab;

(a) (pt.10) Write the SQL INSERT statement for inserting into the Departments table a new department with three projects. The new department has the following attribute values:
- D# is equal to 10
- Dname is equal to ‘CS Research’
- The three projects have the following attributes
  1) P# is equal to 200, Name is equal to ‘CAD’, Budget is equal to 250;
  2) P# is equal to 300, Name is equal to ‘DB’, Budget is equal to 500;
  3) P# is equal to 400, Name is equal to ‘Security’, Budget is equal to 700;

(b) (pt. 10) Suppose that the above insert has been executed and suppose that we need to change the budget of the project with P# equal to 300 of department ‘CS Research’. The budget has to be increased of 50. Write the SQL UPDATE statement for making this change to table Departments.

(c) (pt. 10) Suppose that we want to add a new project to department ‘CS Research’. The new project has the following attributes:
- P# is equal to 400, Name is equal to ‘Graphics’, Budget is equal to 250;
Write the SQL statement for executing this insertion in table Departments.

(d) (pt.10) Write an SQL query that selects from table Departments the sum of the budgets of all the projects in department ‘CS Research’.

(e) (pt. 10) Write an SQL query that selects the names of the projects of department ‘CS Research’ having a budget greater than 600.
2) Consider the following CREATE statements in expressed in the object-relational model of Oracle:

```sql
CREATE TYPE project_t AS OBJECT
    (P# INTEGER,
     Name VARCHAR(20),
     Budget INTEGER) NOT FINAL;

CREATE TYPE special_project_t UNDER project_t
    (Classification_level INTEGER) NOT FINAL;

CREATE TYPE short_special_project_t UNDER special_project_t
    (No_months INTEGER);

CREATE TYPE government_project_t AS OBJECT
    (P# INTEGER,
     Name VARCHAR(20),
     Sector VARCHAR(10) NOT FINAL;

CREATE TABLE Projects OF project_t:
```

(a) (pt.10) List all the attributes of the object type `short_special_project_t`;

(b) (pt.10) Indicate which of the following insert operations can be executed on Projects table:

- INSERT INTO Projects VALUES (project_t(200, 'database security', 700));
- INSERT INTO Projects VALUES (special_project_t(700, 'crypto', 800, 4));
- INSERT INTO Projects VALUES (government_project_t(600, 'APT', 'DoD'));

(c) (pt.10) Write a SQL query that retrieves from table Projects all projects that have a budget greater than 300 and are short special projects.

4) (pt.20) Consider a disk with a block size of 1024 bytes, 4000 tracks per surface, 100 blocks per track, 5 double sided platters.

(a) What is the capacity of the track in bytes? What is the capacity of each surface? What is the capacity of the disk?

(b) How many cylinders does the disk have?